

## Chapter 173-58 WAC

### SOUND LEVEL MEASUREMENT PROCEDURES

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#### WAC

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#### **WAC 173-58-010** Introduction.

- (1) **Authority.** Statutory authority for the guidance and direction contained in these procedures is authorized by chapter 70.107 RCW, the Noise Control Act of 1974.
- (2) **Purpose.** The purpose of these rules is to establish standardized procedures for the measurement of sound levels of sources regulated by the department of ecology, including, but not limited to, environmental noise, motor racing vehicles, construction, float planes, railroads, and aircraft engine testing. Vessels, as defined in RCW 88.12.010 (21) and regulated for noise under chapter 88.12 RCW (Regulation of recreational vessels), shall be exempt from chapter 173-58 WAC.
- (3) **Personnel.** For the purposes of enforcement, the measurements shall be conducted only by persons qualified by training in the use of sound measuring equipment and proper site selection.
- (4) These regulations will be amended as needed to include any new instrumentation, equipment, or procedures which the department shall deem necessary to accurately measure sound levels for enforcement purposes.

[Statutory Authority: Chapter 70.107 RCW. 94-12-001 (Order 92-41), § 173-58-010, filed 5/18/94, effective 6/18/94; 79-04-033 (Order DE 78-19), § 173-58-010, filed 3/22/79.]

**WAC 173-58-020** Definitions. As used in this chapter, unless the context clearly indicates otherwise:

- (1) “Background sound level” means the level of all sounds in a given environment, independent of the specific source being measured.
- (2) “dBA” means the sound pressure level in decibels measured using the "A" weighting network on a sound level meter.
- (3) “Department” means the department of ecology.
- (4) “Director” means the director of the department of ecology.
- (5) “EDNA” means the environmental designation for noise abatement, being an area or zone (environment) within which maximum permissible noise levels are established.

- (6) “Impulse sound” means either a single pressure peak or a single burst of multiple pressure peaks which occur for a duration of less than one second as measured on a peak unweighted sound level meter.
- (7) “Local government” means county or city government or any combination of the two.
- (8) “Noise” means the intensity, duration and character of sounds, from any and all sources.
- (9) “Operator” means any person who is in actual physical or electronic control of a motor vehicle, aircraft, off highway vehicle, or any other engine driven vehicle.
- (10) “Person” means any individual, corporation, partnership, association, governmental body, state agency, or other entity whatsoever.
- (11) “Property boundary” means the surveyed line at ground surface, which separates the real property owned, rented, or leased by one or more persons, from that owned, rented, or leased by one or more other persons, and its vertical extension.
- (12) “Racing event” means any motor vehicle competition conducted under a permit issued by a governmental authority having jurisdiction or, if such permit is not required, then under the auspices of a recognized sanctioning body.
- (13) “Receiving property” means real property within which the maximum permissible noise levels specified in WAC 173-60-040 shall not be exceeded from sources outside such property.
- (14) “Shoreline” means the existing intersection of water with the ground surface or with any permanent, shore-connected facility.
- (15) “Sound level meter” means a device or combination of devices which measures sound pressure levels and conforms to Type 1, Type 2, or Type 3 standards as specified in the American National Standards Institute Specification S1.4-1971. An impulse sound level meter shall be a peak or impulse, unweighted sound level meter which is capable of measuring impulse sound in conformance with the Type 1 or Type 2 specifications of ANSI S1.4-1971.

[Statutory Authority: Chapter 70.107 RCW. 94-12-001 (Order 92-41), § 173-58-020, filed 5/18/94, effective 6/18/94; 79-04-033 (Order DE 78-19), § 173-58-020, filed 3/22/79.]

**WAC 173-58-030 Instrumentation.** The following instrumentation and equipment shall be used for the measurement procedures established in this chapter:

(1) **Sound level meter.** The sound level meter shall meet the Type 1, Type 2, or Type 3 requirements of ANSI S1.4-1971. The meter weighting and response mode will be set as required in the specific procedure used. The sound level meter shall be returned to the manufacturer or a qualified laboratory at least once a year, to be calibrated to standards traceable to the National Bureau of Standards.

Type 1, Type 2, or Type 3 sound level meters shall be used for any initial inspection procedures, but only Type 1 or Type 2 sound level meters shall be used for the measurement of sound levels for enforcement purposes.

(2) **Sound level calibrator.** An acoustically coupled calibrator shall be used periodically to assure the accuracy of the sound level meter and microphone. The calibrator shall be returned to the manufacturer or a qualified laboratory at least once a year to be calibrated to standards traceable to the National Bureau of Standards.

(3) **Tachometer.** The tachometer shall be either one of two types: electric or vibrating reed. The electric tachometer shall be an inductive pickup type for easy attachment to any spark plug cable, contain its own internal power supply, and shall meet SAE J197 specifications for off road

electric tachometers. The vibrating reed tachometer shall be designed for use on any internal combustion engine. Calibration accuracy for both types of tachometers shall be at least  $\pm 3$  percent of full scale reading. All tachometers shall be calibrated at least once a year in accordance with the manufacturer's calibration procedures.

(4) **Windscreen.** A windscreen of open cell foam, cloth, or other acoustically invisible material as shall be provided by the manufacturer, shall be placed over the microphone to protect it from moisture, exhaust gases and wind effects.

(5) **Anemometer.** An anemometer shall be used periodically during measurements to test the wind speed.

[Statutory Authority: Chapter 70.107 RCW. 79-04-033 (Order DE 78-19), § 173-58-030, filed 3/22/79.]

**WAC 173-58-040** Ambient conditions. The following ambient conditions shall be observed during measurements and shall determine whether testing is to occur or not:

(1) **Wind.** Sound level measurements shall not be made when the wind speed is in excess of:

(a) 20 mph (32 km/hr) for the close proximity test, WAC 173-58-080;

(b) 12 mph (19 km/hr) for all other tests.

(2) **Precipitation.** Sound level measurements shall not be made when precipitation is falling in such a way as to affect the equipment or the measurement readings.

(3) **Background sound level.** Sound level measurements shall not be made when the difference between the background sound level and the level of the measured sound source is less than 10 dBA, unless, the measurement personnel are technically qualified to logarithmically subtract the background level from the measured source's sound level.

[Statutory Authority: Chapter 70.107 RCW. 79-04-033 (Order DE 78-19), § 173-58-040, filed 3/22/79.]

**WAC 173-58-050** Measurement equipment preparation and use.

(1) **Battery check.** A battery check shall be conducted on all instruments before field calibration and measurement.

(2) **Calibration.** Sound level meters shall be field calibrated (using procedures described in the manufacturer's instruction manual) at the beginning and end of each measurement period, and at intervals not exceeding two hours when the instrument is used for more than a two-hour period.

(3) **Microphone orientation.** The microphone shall be oriented with respect to the sound source as described in the manufacturer's instruction manual.

[Statutory Authority: Chapter 70.107 RCW. 79-04-033 (Order DE 78-19), § 173-58-050, filed 3/22/79.]

**WAC 173-58-060** Equipment variation allowances. Due to unavoidable variations in measurement sites and test instruments, the following allowances shall be made for the respective sound level meters:

$\pm 1$  dBA                      for Type 1 sound level meters

$\pm 2$  dBA                      for Type 2 sound level meters

This tolerance value shall be applied, after all necessary calculations have been made, to the final reported sound level for the measured sound source.

[Statutory Authority: Chapter 70.107 RCW. 79-04-033 (Order DE 78-19), § 173-58-060, filed 3/22/79.]

**WAC 173-58-070** Environmental noise measurement procedure. (Reserved.)

[Statutory Authority: Chapter 70.107 RCW. 79-04-033 (Order DE 78-19), § 173-58-070, filed 3/22/79.]

**WAC 173-58-080** Close proximity exhaust system sound level measurement procedure. This section establishes specific procedures for the measurement of sound levels from exhaust systems at a distance of 20 inches (0.5 meter) from the exhaust outlet. The procedures of subsections (3), (4) and (5) of this section shall not be used for exhaust systems which utilize the introduction of water to the exhaust gas flow for the purpose of muffling the exhaust noise levels, or systems which exhaust the gas flow directly into water.

(1) For the purposes of this section "vehicle" means any motor driven contrivance used as a means of transportation or recreation off of public highways.

(2) Initial inspection. An initial inspection of the vehicle exhaust system shall be conducted to determine if the following defects or modifications exist:

- (a) The absence of a muffler;
- (b) The presence of a muffler cut-out, bypass, or similar device which is not standard or normal equipment for the exhaust system being inspected;
- (c) Defects in the exhaust system including, but not limited to, pinched outlets, and holes or rusted through areas of the muffler or pipes;
- (d) The presence of equipment which will produce excessive or unusual noise from the exhaust system.

If the above defects are observed and are a violation of the muffler integrity standards established for the type of vehicle which is being inspected, then a citation shall be issued in accordance with the enforcement section of the applicable regulation.

An evaluation of the vehicle sound level shall also be made by the enforcement officer, using the human ear as a sensing device.

If the exhaust noise is discernibly louder than the engine noise, or if any of the defects or modifications described above exist but are not violations of applicable regulations, the enforcement officer shall request the vehicle operator to submit the vehicle to any measurement procedures described in this chapter which are applicable to the type of vehicle being inspected.

If the operator refuses to submit the vehicle to these measurement procedures, he shall be in violation of this chapter.

(3) Test site and instrumentation set up. The test site and instrumentation shall be set up as follows:

- (a) The test site shall be a flat, open area free of large, sound-reflecting surfaces (other than the surface on which the vehicle is resting), such as signboards, buildings, large docks, hillsides, or other vehicles, located within a 16-foot (5-meter) radius of the vehicle being tested and the location of the microphone. The vehicle shall not be on a hoist, rack, or over a pit. Testing shall not occur within a shop or building. Nobody shall stand in the measurement area, except the observer and the vehicle operator.
- (b) The microphone shall be at the same height as the center of the exhaust outlet if possible, but no closer to any surface than 8 inches (0.2 meter). The microphone shall be positioned with its longitudinal axis parallel to the ground,  $20 \pm 1$  inches (0.5 meter) from the edge of ocated

inboard from the vehicle body, the microphone shall be located at the above specified angle and at least 8 inches (0.2 meter) from the nearest part of the vehicle.

For vehicles provided with exhaust outlets spaced more than 12 inches (0.3 meter) apart, measurements shall be made for each outlet as if it were the only one, and the highest level shall be recorded. If the exhaust outlets are less than twelve inches (0.3 meter) apart, a single measurement shall be made for any one of the outlets.

For vehicles with a vertical exhaust, the microphone shall be placed at a height of  $48 \pm 2$  inches (1.2 meter). Its axis shall be vertical and oriented upwards. It shall be placed at a distance of  $20 \pm 1$  inches (0.5 meter) from the side of the vehicle nearest the exhaust outlet.

For vehicles with the exhaust system outlet near the engine, the engine hood (if one exists) should be closed as much as possible to reduce engine noise.

If a measuring device is attached to the exhaust outlet and the microphone to maintain proper distance, insure that no vibrations from the vehicle shall be transmitted to the instrument.

(4) Vehicle operation. The vehicle shall be operated as follows:

(a) Controlled ignition vehicles. The engine shall be operated at a normal operating temperature with transmission in park or neutral. Sound level measurements shall be made at three-fourths (75 percent) of the RPM for rated horsepower  $\pm 100$  RPM of meter reading.

(b) Vehicles with motorcycle engines. The engine shall be operated at normal operating temperatures with the transmission in neutral. If no neutral is provided, the vehicle shall be operated either with the rear wheel or wheels 2-4 inches (5-10 centimeters) clear of the ground, or with the drive chain or belt removed. The sound level measurement shall be made with the engine speed stabilized at one of the following values:

(i) If the engine data is available, test the vehicle at one-half (50 percent) of the RPM for maximum rated horsepower  $\pm 100$  RPM.

(ii) If the engine data is not available, and if the vehicle has a tachometer showing the manufacturer's recommended maximum engine speed ("red line"), test the vehicle at 60 percent of the "red line" RPM  $\pm 100$  RPM.

(iii) If the engine data and red line RPM are not available, test the vehicle at:

(A)  $3500 \pm 100$  RPM for engines with total cylinder displacement between 0-950 cc (0-58 in.3).

(B)  $2800 \text{ RPM} \pm 100 \text{ RPM}$  for engines with total cylinder displacement greater than 950 cc (58 in.3).

(c) Diesel engine vehicles. The engine shall be operated at normal operating temperatures with transmission in park or neutral. Sound level measurements shall be made at the vehicle's maximum governed no-load speed. If the engine is not provided with a governor, the vehicle shall be operated in the same manner as a vehicle with a controlled ignition.

(5) Measurement. The exhaust system sound level shall be measured as follows:

(a) The sound level meter shall be set for slow response and on the "A" weighting scale.

(b) The sound level meter shall be observed during the full cycle of engine acceleration-deceleration. The recorded sound level shall be the highest value obtained at the appropriate, constant engine speed as specified in subsection (4) of this section, and shall exclude peaks due to unrelated ambient noise, engine noise, or extraneous impulsive-type noise.

- (c) At least two measurements shall be made, and the reported sound level shall be the average of the two highest readings which are within one dBA of each other.

[Statutory Authority: Chapter 70.107 RCW. 79-04-033 (Order DE 78-19), § 173-58-080, filed 3/22/79.]

**WAC 173-58-090** Reserved.

[Statutory Authority: Chapter 70.107 RCW. 94-12-001 (Order 92-41), § 173-58-090, filed 5/18/94, effective 6/18/94; 79-04-033 (Order DE 78-19), § 173-58-090, filed 3/22/79.]